Having described the invention, we claim:

1. An apparatus for providing an *in vivo* assessment of loads on adjacent bones, said apparatus comprising:

a body for insertion between the adjacent bones;

at least one sensor associated with said body, said at least one sensor for generating an output signal in response to and indicative of a load being applied to said body through the adjacent bones; and

at least one telemetric device operatively coupled with said at least one sensor, said at least one telemetric device being operable to receive said output signal from said at least one sensor and to transmit an EMF signal dependent upon said output signal.

2. The apparatus of claim 1 wherein said body comprises an implant for helping the adjacent bones to fuse together.

3. The apparatus of claim 2 wherein said implant comprises a fusion cage for insertion between an adjacent pair of vertebrae, said fusion cage having an interior chamber for receiving bone graft material.

4. The apparatus of claim 1 wherein said body comprises a bone graft.

5. The apparatus of claim 1 wherein said at least one sensor comprises a pressure sensor.

6. The apparatus of claim 1 wherein said at least one sensor further comprises a load cell.

7. The apparatus of claim 1 further comprising an implant connected with the adjacent bones for helping to stabilize the adjacent bones while the adjacent bones fuse together.

8. The apparatus of claim 7 further comprising at least one strain gauge mounted on said implant, said at least one strain gauge for generating a second output signal in response to a load being applied to said implant, said at least one strain gauge being

electrically connected with said at least one telemetric device.

9. The apparatus of claim 1 wherein said body comprises a prosthetic device for preserving motion between adjacent bones.

10. An apparatus for providing an *in vivo* assessment of loads on adjacent bones to be fused together, said apparatus comprising:

a graft for insertion between the adjacent bones;

at least one sensor associated with said graft, said at least one sensor for generating an output signal in response to and indicative of a load being applied to said graft through the adjacent bones; and

at least one telemetric device operatively coupled with said at least one sensor, said at least one telemetric device being operable to receive said output signal from said at least one sensor and to transmit an EMF signal dependent upon said output signal.

11. The apparatus of claim 10 further comprising an implant connected with the adjacent bones for helping to stabilize the adjacent bones while the adjacent bones fuse together.

12. The apparatus of claim 10 wherein said at least one sensor comprises a pressure sensor.

13. The apparatus of claim 12 further comprising an implant connected with the adjacent bones for helping to stabilize the adjacent bones while the adjacent bones fuse together.

14. The apparatus of claim 13 further comprising at least one strain gauge mounted on said implant, said at least one strain gauge for generating a second output signal in response to a load being applied to said implant, said at least one strain gauge being electrically connected with said at least one telemetric device.

15. The apparatus of claim 12 wherein said at least one sensor further comprises a load cell.

16. The apparatus of claim 15 further comprising an implant connected with the adjacent bones for helping to stabilize the adjacent bones while the adjacent bones fuse together.

17. The apparatus of claim 15 further comprising at least one strain gauge mounted on said implant, said at least one strain gauge for generating a second output signal in response to and indicative of a load being applied to said implant, said at least one strain gauge being electrically connected with said at least one telemetric device.

18. The apparatus of claim 10 wherein said at least one sensor comprises a load cell.

19. The apparatus of claim 18 further comprising an implant connected with the adjacent bones for helping to stabilize the adjacent bones while the adjacent bones fuse together.

20. The apparatus of claim 19 further comprising at least one strain gauge mounted on said implant, said at least one strain gauge for generating a second

output signal in response to and indicative of a load being applied to said implant, said at least one strain gauge being electrically connected with said at least one telemetric device.

21. An apparatus for providing an *in vivo* assessment of loads on adjacent vertebrae to be fused together, the adjacent vertebrae being separated by an intervertebral space created by the removal of an intervertebral disc, said apparatus comprising:

a bone graft for insertion into the intervertebral space;

at least one sensor associated with said bone graft, said at least one sensor for generating an output signal in response to and indicative of a load being applied to said bone graft through the adjacent pair of vertebrae; and

at least one telemetric device operatively coupled with said at least one sensor, said at least one telemetric device being operable to receive said output signal from said at least one sensor and to transmit an EMF signal dependent upon said output signal.

22. The apparatus of claim 21 wherein said at least one sensor comprises a pressure sensor.

23. The apparatus of claim 22 wherein said pressure sensor is positioned in an interior portion of said bone graft.

24. The apparatus of claim 22 wherein said at least one sensor further comprises at least one load cell.

25. The apparatus of claim 24 wherein said at least one load cell is countersunk into a surface of said bone graft that faces one of the adjacent bones.

26. The apparatus of claim 21 wherein said at least one sensor comprises at least one load cell.

27. The apparatus of claim 19 further comprising:

an implant connected with the adjacent bones for helping to stabilize the adjacent bones while the adjacent bones fuse together; and

at least one strain gauge mounted on said implant, said at least one strain gauge for generating

a second output signal in response to and indicative of a load being applied to said implant, said at least one strain gauge being electrically connected with said at least one telemetric device.

28. The apparatus of claim 27 wherein said at least one telemetric device is mounted on said implant and operatively coupled to said at least one sensor.

29. The apparatus of claim 27 wherein said at least one telemetric device and said at least one sensor are formed on a silicon substrate and secured within said bone graft, said at least one telemetric device being operatively coupled to said at least one strain gauge.

30. An apparatus for providing an *in vivo* assessment of loads on adjacent bones to be fused together, said apparatus comprising:

a bone graft for insertion between the adjacent bones;

a pressure sensor associated with said bone graft, said pressure sensor for generating a first output signal in response to and indicative of a load

being applied to said bone graft through the adjacent bones; and

a load cell associated with said bone graft, said load cell for generating a second output signal in response to and indicative of the load being applied to said bone graft through the adjacent bones.

31. The apparatus of claim 30 wherein said pressure sensor is positioned in an interior portion of said bone graft.

32. The apparatus of claim 30 wherein said pressure sensor is coated with a film of biomolecules to protect said pressure sensor.

33. The apparatus of claim 30 wherein said pressure sensor is coated with monolayers of biomolecules to protect said pressure sensor.

34. The apparatus of claim 30 wherein said pressure sensor is coated with thin layers of biocompatible materials to protect said pressure sensor.

35. The apparatus of claim 30 wherein said load cell is countersunk into a surface of said bone graft that faces one of the adjacent bones.

36. The apparatus of claim 30 wherein said load cell is coated with a film of biomolecules to protect said load cell.

37. The apparatus of claim 30 wherein said load cell is coated with monolayers of biomolecules to protect said load cell.

38. The apparatus of claim 30 wherein said load cell is coated with thin layers of biocompatible materials to protect said load cell.

39. The apparatus of claim 30 further comprising at least one telemetric device operatively coupled with said pressure sensor and with said load cell, said at least one telemetric device being operable to receive said first and second output signals and to transmit EMF signals dependent upon said output signals.

40. The apparatus of claim 39 further comprising:

an implant connected with the adjacent bones for helping to stabilize the adjacent bones while the adjacent bones fuse together; and

at least one strain gauge mounted on said implant, said at least one strain gauge for generating a third output signal in response to and indicative of the load being applied to said implant, said at least one strain gauge being operatively coupled with said at least one telemetric device.

41. An apparatus for providing an *in vivo* assessment of loads on adjacent bones to be fused together, said apparatus comprising:

a graft for insertion between the adjacent bones;

at least one sensor associated with said graft, said at least one sensor for generating a first output signal in response to and indicative of a load being applied to said graft;

an implant connected with the adjacent bones for helping to stabilize the adjacent bones while the adjacent bones are fusing together; and

at least one strain gauge mounted on said implant, said at least one strain gauge for generating a second output signal in response to and indicative of the load being applied to said implant.

42. The apparatus of claim 41 wherein said at least one sensor comprises a pressure sensor.

43. The apparatus of claim 41 wherein said at least one sensor further comprises a load cell.

44. The apparatus of claim 41 wherein said implant includes a platform and at least one rod, said at least one strain gauge being mounted to one of said platform and said at least one rod.

45. The apparatus of claim 41 further comprising at least one telemetric device operatively coupled with said at least one sensor and with said at least one strain gauge, said at least one telemetric device being operable to receive said first and second output signals and to transmit EMF signals dependent upon said output signals percutaneously.

46. The apparatus of claim 45 further comprising an external monitoring unit for receiving said EMF signals transmitted percutaneously.

47. An apparatus for providing an *in vivo* assessment of loads on adjacent bones to be fused together, said apparatus comprising:

a body for insertion between the adjacent bones;

sensor means for sensing a load being applied to said body through the adjacent bones and for generating a corresponding output signal in response to and indicative of a sensed load; and

first circuit means operatively coupled with said sensor means for receiving said output signal from said sensor means, said first circuit means including antenna means for receiving energy to power said first circuit means and said sensor means and for transmitting an EMF signal dependent upon said output signal.

48. The apparatus of claim 47 wherein said first circuit means includes signal processing means and telemetry means.

49. The apparatus of claim 47 wherein said first circuit means further includes an RF-DC converter/modulator and a voltage regulator operatively coupled between said antenna means and said at least one sensor, said RF-DC converter/modulator and said voltage regulator providing electrical energy received by said antenna means to said at least one sensor.

50. The apparatus of claim 49 wherein said first circuit means further includes a microprocessor operatively coupled between said at least one sensor and said RF-DC converter/modulator, said microprocessor and said RF-DC converter/modulator receiving said output signal from said at least one sensor and converting said output signal into said EMF signal for percutaneous transmission via said antenna means.

51. The apparatus of claim 47 further comprising second circuit means for transmitting energy to power said first circuit means and said sensor means and for receiving said data signal, said second means being disposed remote from said first circuit means.

52. An apparatus for providing an *in vivo* assessment of loads on and motion of one or more bones, said apparatus comprising:

a member for placement adjacent a bone;

at least one sensor associated with said member, said at least one sensor for generating an output signal in response to and indicative of a load being applied to said member through the bone; and

at least one telemetric device operatively coupled with said at least one sensor, said at least one telemetric device being operable to receive said output signal from said at least one sensor and to transmit an EMF signal dependent upon said output signal.

53. The apparatus of claim 52 wherein said member comprises an implant for helping adjacent bones fuse together.

54. The apparatus of claim 53 wherein said implant comprises a fusion cage for insertion between an adjacent pair of vertebrae.

55. The apparatus of claim 52 wherein said member comprises a bone graft.

56. The apparatus of claim 52 wherein said member comprises a prosthetic device for preserving motion between adjacent bones.

57. The apparatus of claim 56 wherein said prosthetic device comprises an artificial disc.

58. An apparatus for providing an *in vivo* assessment of loads on and motion of one or more bones, said apparatus comprising:

at least one sensor attached to a bone, said at least one sensor for generating an output signal in response to and indicative of a load on the bone; and

at least one telemetric device operatively coupled with said at least one sensor, said at least one telemetric device being operable to receive said output signal from said at least one sensor and to transmit an EMF signal dependent upon said output signal.

59. The apparatus of claim 58 wherein said at least one sensor comprises a pressure sensor.

60. The apparatus of claim 59 wherein said pressure sensor is positioned in an interior portion of a vertebrae.

61. A method for *in vivo* assessing the loads on adjacent vertebrae to be fused together, said method comprising the steps of:

harvesting a bone graft;

removing an intervertebral disc between the adjacent vertebrae;

instrumenting the bone graft with at least one sensor for sensing a load on the bone graft and for generating an output signal indicative of a sensed load;

operatively coupling at least one telemetric device with the at least one sensor to receive the output signal and to transmit an EMF signal dependent upon the output signal;

implanting the bone graft between the adjacent vertebrae; and

monitoring the EMF signal from the least one telemetric device.

62. The method of claim 61 further wherein said step of instrumenting the bone graft with at least one sensor comprises securing a pressure sensor to the bone graft.

63. The method of claim 61 further comprising the step of coating the pressure sensor with thin layers of a biocompatible material.

64. The method of claim 61 further comprising the step of coating the pressure sensor with monolayers of biomolecules.

65. The method of claim 61 further comprising the step of coating the pressure sensor with a film of biomolecules.

66. The method of claim 61 further wherein said step of instrumenting the bone graft with at least one sensor further comprises securing a load cell to the bone graft.

67. The method of claim 66 further comprising the step of coating the load cell with thin layers of a biocompatible material.

68. The method of claim 66 further comprising the step of coating the load cell with monolayers of biomolecules.

69. The method of claim 66 further comprising the step of coating the load cell with a film of biomolecules.

70. The method of claim 61 further comprising the step of attaching an implant to the adjacent vertebrae to help stabilize the vertebrae while fusing together.

71. The method of claim 70 further comprising the steps of:

mounting at least one strain gauge to the implant; and

operatively coupling the at least one strain gauge to the least one telemetric device.

72. The method of claim 61 further comprising the step of inductively energizing the at least one sensor and the least one telemetric device.

73. A method for *in vivo* assessing the loads on adjacent bones to be fused together, said method comprising the steps of:

providing a body for insertion between the adjacent bones;

instrumenting the body with at least one sensor for sensing a load on the body and for generating an output signal indicative of a sensed load;

operatively coupling at least one telemetric device with the at least one sensor to receive the output signal and to transmit an EMF signal dependent upon the output signal;

implanting the body between the adjacent bones; and

monitoring the EMF signal from the least one telemetric device.

74. The method of claim 73 wherein said step of providing a body comprises providing a prosthetic

implant for helping the adjacent bones to fuse together.

75. The method of claim 74 further comprising the step of filling the interior of the prosthetic implant with bone graft material following implantation of the prosthetic implant.

76. The method of claim 73 wherein said step of providing a body comprises harvesting a bone graft.

77. A method for *in vivo* assessing of loads on and motion of one or more bones, said method comprising the steps of:

providing a member for placement adjacent a bone;

instrumenting the member with at least one sensor for generating an output signal in response to and indicative of a load being applied to the member through the bone;

operatively coupling at least one telemetric device with the at least one sensor to receive the output signal from the at least one sensor and to

transmit an EMF signal dependent upon the output signal;

inserting the member adjacent the bone; and

monitoring the EMF signal from the least one telemetric device.